

## PATENT SPECIFICATION

(11) 1309967

2

6

6

0

6

5

4

4

## DRAWINGS ATTACHED

(21) Application No. 15589/71 (22) Filed 18 May 1971  
 (31) Convention Application No. P 20 26 566.1  
 (32) Filed 30 May 1970 in  
 (33) Germany (DT)  
 (44) Complete Specification published 14 March 1973  
 (51) International Classification B23K 11/02  
 (52) Index at acceptance  
 B3R 2F 2K 6

(19)

(54) IMPROVEMENTS IN AND RELATING TO  
PERMANENTLY CONNECTING TOGETHER MACHINE  
PARTS IN CONCENTRIC ARRANGEMENT

(71) We, ZAHNRADFAIRIK FRIEDRICHSHAFEN AKTIENGESELLSCHAFT, of Friedrichshafen - on - the Bodensee, Germany, a Joint-Stock company organised under the laws of Germany, and 5 H. A. SCHLATTER AKTIENGESELLSCHAFT FABRIK ELEKTOR SCHWEISSMASCHINEN, of Braudstrasse, 892 Schlieren ZH/Switzerland, a Joint-Stock Company organised under the laws of Switzerland, 10 do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and 15 by the following statement:—

This invention relates to a method of permanently connecting together machine parts in coaxial arrangement, for example a gearwheel and clutch plate of a synchronised motor vehicle change-speed gear, by resistance pressure-welding.

The present invention consists in a method of permanently connecting together machine parts in coaxial arrangement by resistance-pressure welding, characterised in that the two parts to be welded are each provided with at least one annular groove extending axially or substantially axially of said parts, each groove being of such a shape and so situated that two annular lugs are formed which abut axially against one another and form a weld joint and which have a substantially constant wall thickness.

The relatively small cross-section of the 35 annular lugs causes heat to accumulate at the weld. The welding power is thereby reduced and less distortion results. The elasticity of the weld is increased.

In order that the invention may be more 40 readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example, two embodiments thereof, and in which:—

Figure 1 shows a half-view in cross-section of a gear-wheel and a dog ring provided with

a synchronising cone, with two recesses of rectangular cross-section before commencement of the welding,

Figure 2 shows the same view after the welding,

Figure 3 is a view similar to that of Figure 1, showing a gearwheel provided with a synchronising cone and a dog ring, one annular end face of which abuts against an annular shoulder formed on the gearwheel,

Figure 4 shows the arrangement according to Figure 3 on completion of the welding.

In Figure 1, reference numeral 1 designates a gearwheel having an axis of rotation 2, and which is to be welded to a dog ring 3 provided with clutch dogs 4 and a synchronising ring 5. The gearwheel 1 has an axially extending recess 6 and the dog ring 3 a likewise axially extending recess 7. Both recesses 6 and 7 are of rectangular cross-section. The gearwheel 1 is provided with a shoulder 8 the contour of which before the formation of the recess 6 is shown in dot-and-dash lines. The dog ring 3 has a shoulder 9 the contour of which before the formation of the recess 7 is likewise shown in dot-and-dash lines. By virtue of the recessing an annular lug 10 and 11 is respectively formed on the two parts 1 and 3 to be welded together. The two annular lugs 10 and 11 abut against one another with their two end faces and form the welding joint 12.

In an embodiment of a resistance-pressure welding apparatus (not shown), the parts 1 and 3 are clamped in position co-axially with the axis 2 and connected in the welding circuit, which is closed by the welding joint 12. During the welding the parts 1 and 3 are moved towards one another in the direction of the axis 2 until the two mutually facing end faces 1' and 13 respectively of the gearwheel 1 and the dog ring 5 contact one another. This position of the parts 1 and 5 in the welded condition is shown in Figure 2. The welding seam 12' is marked by cross-hatching. The comparatively thin annular lugs

50

55

60

65

70

75

80

85

90

[Price 25p]

10 and 11 cause heat to accumulate at the joint during the welding, thus providing the advantages described in the introduction of the present specification.

5 Figure 3 shows a dog ring 21 which is provided with clutch dogs 20 and an end face 31 and which is to be welded to a gearwheel 22. The latter has a synchronizing cone 23 and a shoulder 24 which at 25 and 26 is recessed in the axial direction. The contour of the shoulder 24 existing before the recessing is completed in dot-and-dash lines. The dog ring 21 is provided with an axially directed recess 27. The recesses form comparatively thin annular parts 28 and 29 respectively in the dog ring 21 and in the shoulder 24 on the gearwheel 22, and these annular parts abut against one another at 30 and form the weld joint. Figure 4 shows the completed welded connection with the weld 30.

10 The cross-section of the recesses 6, 7, 25, 26 and 27 may have a different shape from the rectangular, for example trapezoidal, in which case the side surface of the trapezium remote 15 from the annular part 10 or 11, 28, 29 is inclined in relation to the opposite side which is parallel to the axis 2.

WHAT WE CLAIM IS:—

15 1. A method of permanently connecting together machine parts in coaxial arrangement by resistance-pressure welding, characterised in that the two parts to be welded are each provided with at least one annular groove extending axially or substantially axially of

20 said parts, each groove being of such a shape and so situated that two annular lugs are formed which abut axially against one another and form a weld joint and which have a substantially constant wall thickness.

25 2. A method as claimed in claim 1, wherein the grooves are formed in an annular shoulder of one part to be welded and in an annular shoulder of the other part to be welded.

30 3. A method as claimed in claim 1, wherein one part to be welded has an axial groove and the other part to be welded has two axial grooves, said one groove being formed in an end face of said one part to be welded and one of said two grooves is formed in an annular shoulder and the other of said two grooves in an end face of the other part to be welded.

35 4. A method of permanently connecting together machine parts, in coaxial arrangement by resistance-pressure welding substantially as herein described with reference to Figures 1 and 2 or 3 and 4 of the accompanying drawings.

40 5. Two parts whenever permanently connected together by the method claimed in any one of the preceding claims.

45 VENNER, SHIPLEY & CO.,  
Chartered Patent Agents,  
Rugby Chambers,  
2, Rugby Street,  
London, W.C.1.  
Agents for the Applicants.

50 Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1973.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.

1309967 COMPLETE SPECIFICATION  
2 SHEETS *This drawing is a reproduction of  
the Original on a reduced scale*  
Sheet 1

Fig.1

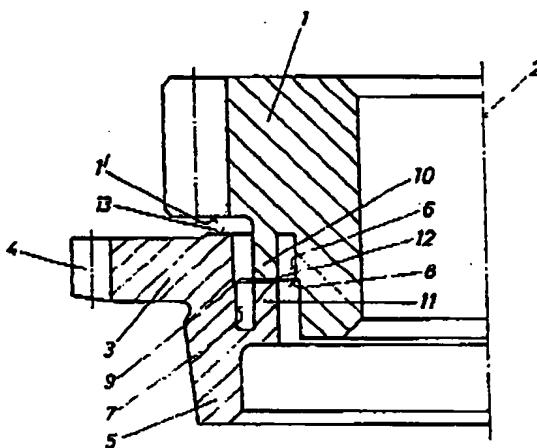
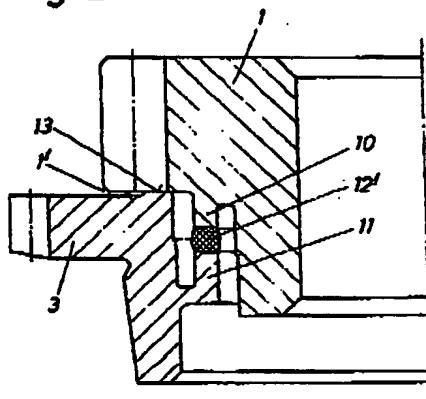


Fig. 2



1309967

COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of  
the Original on a reduced scale*

Sheet 2

Fig. 3

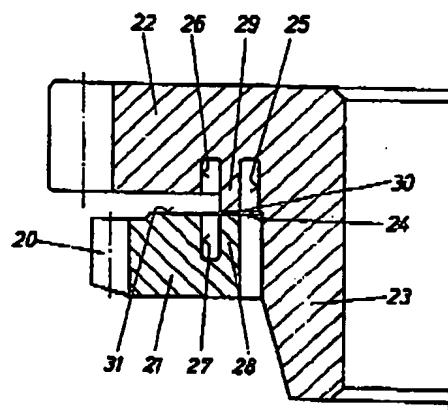
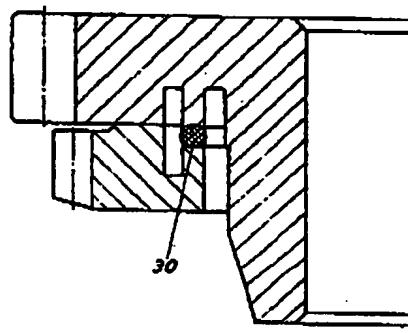


Fig. 4



**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER: \_\_\_\_\_**

**IMAGES ARE BEST AVAILABLE COPY.**  
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.